

A taxonomic account of the genus *Calotropis* R.Br. (Asclepiadaceae) in Australia

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Abstract

Forster, P.I. A taxonomic account of the genus *Calotropis* R. Br. (Asclepiadaceae) in Australia. Nuytsia 8(2): 201-208 (1992). Two species of *Calotropis* R.Br., *C. procera* (Ait.) Ait. f. and *C. gigantea* (L.) Ait. f., occur naturalised in Australia.

Introduction

The Asclepiadaceae contains a wide range of showy ornamental plants of which taxa from several genera have been introduced into Australia as garden plants or accidentally as weeds. Two species from the genus *Calotropis* R. Br. represent such introductions and it is uncertain as to whether the most widespread of these, *C. procera* (Ait.) Ait. f. was introduced as a garden plant or from seed in packing of Afghan cameleers gear (Hall 1967).

As with many introduced plants, particularly those considered to be weeds, data in the form of herbarium records is often scant; this has certainly proved to be the case with *Calotropis*. When the last overall treatment of the Asclepiadaceae in Australia was published (Bentham 1869), no species of *Calotropis* were recorded as present in Australia. Based on herbarium records the naturalisations outlined below appear to have occurred within the last 50 years. While *C. procera* has been described and illustrated in a number of guides to weeds (e.g. Kleinschmidt & Johnson 1977), the second species, *C. gigantea* (L.) Ait. f. has not been listed to occur in Australia (e.g. Dunlop 1987), the chance references to it usually pertaining to *C. procera*. In addition, the author citations for both species are often incorrectly given, e.g. "*C. procera* (Willd.) R. Br. ex Ait." Thus it is considered timely with the preparation of a 'Flora of Australia' account of the Asclepiadaceae by the author, to provide a detailed taxonomic account of these plants in Australia, together with details of their general ecology. As *C. procera* is of some importance as a source of fodder during drought (McAdly 1971, Radunz *et al.* 1984) or as a possible fuel source (Airey *et al.* 1981, Erdman & Erdman 1981), it is essential that the plants of this genus in Australia are correctly identified.

Taxonomic History

The genus *Calotropis* was first described by Robert Brown (1810) in a preprint of Brown (1811). Brown did not list any species in these accounts. Aiton (1811) included both *Asclepias gigantea* L. and *A. procera* Ait. within *Calotropis*, and the latter is considered to be the type of the genus. Ali (1980)

considered that the genus 'consists of about four species'; however, apart from *C. procera* and *C. gigantea* which are widely cultivated or naturalised in the tropics, the other species are poorly known.

Materials & Methods

This account is based on herbarium holdings at AD, BRI, CANB, DNA, JCT, NE, PERTH and QRS and field collections made in northern Australia during 1988-1990.

Taxonomic Treatment

Calotropis R. Br., On Asclepiad. 28 (1810); Mem. Wern. Nat. Hist. Soc. 1: 39 (1811); Wight, Contrib. Bot. India 53 (1834); J.D. Hook., Fl. Brit. India 4: 17 (1883); Gamble, Fl. Madras 2: 834 (1923); Huber in Abeyw., Rev. Handb. Fl. Ceylon 1(1): 35 (1973).

Type: Asclepias procera Ait. (= *Calotropis procera* (Ait.) Ait. f.)

Erect, woody, perennial shrubs to small trees, latex white. Young foliage with dense white indumentum. Mature foliage with thick glaucous wax cover. Leaves opposite, somewhat fleshy. Calyx deeply 5-lobed. Corolla 5-lobed; lobes valvate in bud, free for about two-thirds of length. Staminal corona single, comprising 5 fleshy, laterally compressed lobes adnate to staminal column for entire length; basally with a recurved vesicle; apically with a pair of auricles. Stamens connate into staminal column; anthers with membranous terminal appendage. Pollinaria with 2 pollinia; pollinia pendulous, ellipsoid, lacking a pellucid germinating mouth; corpusculum ovate; caudicles unwinged, not geniculate. Style-head conical. Carpels glabrous. Follicles ovoid, inflated with air sac around seed producing region. Seeds flattened, ovate; comose at micropylar end.

Distribution. Three or four species occurring naturally in northern Africa, Arabia and tropical Asia, with two species widely naturalised in other tropical regions.

Key to species of *Calotropis* in Australia.

- 1a. Corolla 2.3-2.5 cm diameter; sepals 7-8 mm long 1. *C. procera*
 1b. Corolla 3-5.5 cm diameter; sepals 3-4 mm long 2. *C. gigantea*

1. *Calotropis procera* (Ait.) Ait. f., Hort. Kew. ed 2, 2: 78 (1811); *Asclepias procera* Ait., Hort. Kew. 1: 305 (1789). *Lectotype*: N.J. Jacquin, Observationum botanicorum iconibus. part 3: t.69 (1768) [as *Asclepias gigantea*], *fide* Ali, Notes R.B.G. Edinb. 38: 290 (1980).

Two subspecies were recognised by Ali (1980) of which only subsp. *procera* is naturalised in Australia.

Woody erect shrub to 2.5 m. Stems cylindrical, up to 1 cm diameter on foliage bearing parts, glabrous; internodes up to 6 cm long, with a grey-green pruinose bloom. Leaves elliptic, up to 18 cm long and 15 cm wide; above venation obscure; below with 6 major secondary veins per side of midrib prominent; tip acute to rounded; base cordate to auriculate; petiole 3-4 mm long, 4-5 mm wide; extrafloral nectaries



Figure 1. A-D-*Calotropis procera*, E-F-C. *gigantea*. A-habit of flowering branch. B & E-apical view of flower. C-side view of flower with part of corolla removed showing staminal column. D & G-side view of staminal corona and staminal column. F-side view of flower. (All actual size).

20-27 at lamina base. Cyme up to 10 cm long with 1-12 fascicles; bracts lanceolate, 8-13 mm long, 3.5-6 mm wide, glabrous or with scattered to sparse indumentum, tip shortly acuminate; peduncle up to 3.5 cm long, 2-7 mm diameter, glabrous, or with scattered to sparse indumentum and with a grey-green pruinose bloom. Flowers campanulate, 13-20 mm long, 23-25 mm diameter, with a slightly sweet scent; pedicels 15-27 mm long, 1-2.5 mm diameter, cream, glabrous or with scattered to sparse indumentum. Sepals ovate, 7-8 mm long, c. 5 mm wide, cream, glabrous, base of each sinus with 3-9 glands. Corolla tube cream, c. 5 mm long, 10-11 mm diameter; lobes lanceolate-ovate, 9-10 mm long, 9-10 mm wide, cream with purple tips internally, cream externally. Staminal corona 4-5 mm long, 9-10 mm diameter; each lobe c. 6 mm long, c. 1 mm wide at middle and 4 mm wide at outer edges, edges purple, cream next to staminal column. Staminal column c. 9 mm long and 5 mm diameter, cream; anther appendages truncate-obtuse, c. 3 mm long and 3.5 mm wide; alar fissure 0.75-1 mm long. Style-head c. 5 mm diameter, cream, extending 1 mm above anthers. Carpels c. 6 mm long and 3 mm wide. Pollinarium 2-2.1 mm long, 0.9-1 mm wide; pollinia oblong, 1.35-1.45 mm long, 0.55-0.6 mm wide; corpusculum oblong, 0.45 mm long, 0.1-0.15 mm wide, with a wing of tissue around edges that is a continuation of the caudicle tissue; caudicles 0.35-0.4 mm long, 0.05 mm wide. Follicle 10-12 cm long, 6-7 cm wide. Seed 8-8.5 mm long, c. 5 mm wide; coma 25-28 mm long, white. Figure 1A-D.

Selected specimens examined. WESTERN AUSTRALIA: Kununurra Racetrack, 15° 49' S, 128° 45' E, *P.I. Forster* 5906 (BRI, DNA, PERTH); One Arm Point, NE Dampierland, 16° 26' S, 123° 05' E, *B.J. Carter* 90 (PERTH); 60.4 km N of Halls Ck on road to Turkey Ck, 17° 47' S, 127° 48' E, *T.E. Aplin, R. Cranfield & J. Wheeler* 346 (PERTH).

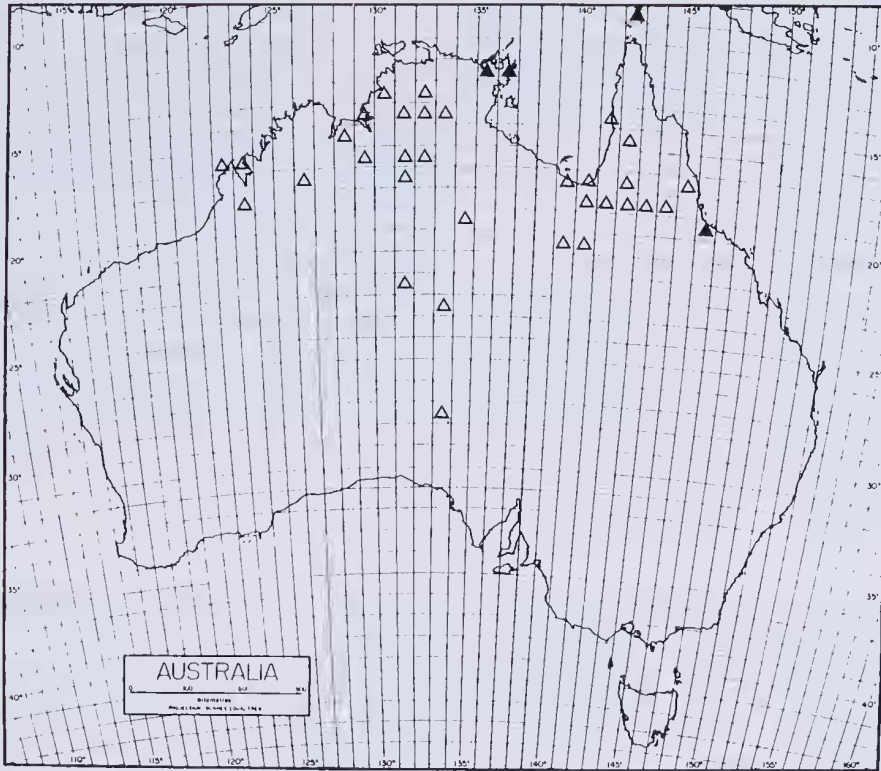
NORTHERN TERRITORY: Peron Is, 13° 11' S, 130° 03' E, *T.S. Henshall* 812 (DNA); Injin Beach, Port Keats, 14° 13' S, 129° 26' E, *G. Wightman* 572 & *C. Dunlop* (DNA); 5 km W of Katherine on the Victoria Hwy, 14° 28' S, 132° 13' E, *N.F. Norris* 857 (DNA); Mouth of Keep River, 14° 59' S, 129° 11' E, *J. Russell-Smith* 7558 & *D. Lucas* (DNA); Ivanhoe Plain, Ord River Irrigation area, 15° 33' S, 128° 49' E, *M. Rankin* 2948 (DNA); 8 km N of Rosewood Stn turnoff, Duncan Hwy, 16° 23' S, 129° 03' E, *P.I. Forster* 5911 (BRI, DNA); Middle Ck, Victoria River Downs, 16° 23' S, 131° 14' E, *J. Must* 1577 (CANB, DNA); 21 km past Top Springs on Buchanan Hwy to Timber Ck, 16° 27' S, 131° 39' E, *P.I. Forster* 5899 (BRI, DNA); 85 km along Buchanan Hwy on way to Top Springs, 16° 46' S, 132° 40' E, *P.I. Forster* 5896 (BRI, DNA); c. 21 km N of Yuendumu, 22° 09' S, 131° 49' E, *P.K. Latz* 8806 (DNA); Simpson Gap N.P., 23° 42' S, 133° 48' E, *P.K. Latz* 8565 (DNA).

QUEENSLAND: Chillagoe, *S.T. Blake* 14737 (BRI); 10 km from Dimbulah on Petford road, 17° 10' S, 145° 00' E, *B. Hyland* 8468 (BRI, QRS); roadside outside Karumba, 17° 28' S, 140° 50' E, *V.J. Neldner* 2445 & *T.D. Stanley* (BRI); 40 Mile Scrub, c. 5 km N of the junction of Kennedy Hwy and Gulf Development road, 18° 07' S, 144° 49' E, *J.R. Clarkson* 2529 & *N.B. Byrnes* (BRI); 38 km from Georgetown on Croydon road, 18° 16' S, 143° 12' E, *P.I. Forster* 3841 (BRI); 1 km E of Georgetown, 18° 17' S, 143° 34' E, *P.I. Forster* 3820 (BRI); Boiler Ck, 10 km past Greenvale on Gregory Developmental road to The Lynd, 18° 58' S, 144° 54' E, *P.I. Forster* 3788 (BRI); 55 km from Mt Isa on Cloncurry road, 20° 48' S, 139° 59' E, *P.I. Forster* 6135 (BRI, DNA); 106 km from Mt Isa on Cloncurry road, near Duchess turnoff, 20° 44' S, 140° 27' E, *P.I. Forster* 6136 (BRI, DNA).

SOUTH AUSTRALIA: Beside Stuart Hwy, c. 70 km S of Marla, *N.G. Walsh* 1713 (AD, DNA).

Distribution. *C. procera* is widely distributed in northern tropical Australia, but is also naturalised in a few scattered localities in inland central Australia. Map 1.

Habitat. Plants are most commonly encountered on roadsides, however very large infestations may occur on black soil plains such as those on Victoria River Downs in the Northern Territory or on coastal dune systems in the south-eastern Gulf of Carpentaria.



Map 1. Distribution in Australia of *Calotropis procera* (open triangles) and *C. gigantea* (closed triangles), mapped within $1^\circ \times 1^\circ$ grid squares.

Flowering period. Throughout the year with a concentration during the spring, summer and autumn months.

Fruiting period. 2-3 months after flowering.

Notes. Studies of *C. procera* within its natural range have found polymorphism both in floral morphology (Bhatnagar 1975) and germination (Amritphale *et al.* 1984). The flowers, in particular the coronal lobes of the Australian populations of *C. procera* are quite uniform in form and this may well indicate that the naturalised populations are a result of one or very few naturalisation events not encompassing the possible variation known for this species.

2. *Calotropis gigantea* (L.) Ait. f., Hort. Kew. ed. 2, 2: 78 (1811); *Asclepias gigantea* L., Sp. Pl. 214 (1753); Wight, Contrib. Bot. India 53 (1834); Wight, Ill. Ind. Bot. t. 155-156 (1850); J.D. Hook., Fl. Brit. India 4: 17 (1883); Huber in Abeyw., Rev. Handb. Fl. Ceylon 1(1): 35 (1973); Matthew, Ill. Fl. Tamilnadu Carnatic 437 (1982); Rani & Matthew, Fl. Tamilnadu Carnatic 2: 929-930 (1983).

Type: Herbarium Hermann 2: 74 (BM n.v.) *fide* Ali, Fl. Pakistan 150: 9 (1983).

Woody, erect shrub to 4 m. Stems cylindrical, up to 6 cm diameter on foliage bearing parts, glabrous; internodes up to 5 cm long, with glaucous white bloom. Leaves petiolate; lamina elliptic to oblong, up to 10 cm long and 8 cm wide, coriaceous, somewhat fleshy, glabrous; above venation obscure; below with 6 or 7 secondary veins per side of midrib prominent; tip acute to rounded; base cordate to auriculate; sessile or with petiole 0.2-0.7 mm long, c. 0.2 mm wide; extrafloral nectaries 19-20 at lamina base. Cyme up to 10 cm long with 1-3 fascicles of flowers; bracts lanceolate, 6-7 mm long, 2-3 mm wide, with scattered indumentum, tip acute; peduncle up to 3.2 cm long, 2-4 mm diameter, waxy glaucous or with scattered indumentum. Flower campanulate, 24-25 mm long, 30-55 mm diameter; pedicels 2.5-4 cm long, 1-2.3 mm diameter, with scattered indumentum. Sepals lanceolate-ovate to ovate, 5-7 mm long, c. 4 mm wide, ciliate, base of each sinus lacking extrafloral nectaries. Corolla tube 5-6 mm long, 14-15 mm diameter, glabrous; lobes ovate, fleshy, 15-17 mm long, 10-11 mm wide, glabrous, tips acute. Staminal corona 11-12 mm long, 14-15 mm diameter, consisting of 5 lobes fused for entire length to staminal column; each lobe broadly flanged, 11-12 mm long, 6-6.5 mm wide, with the base elongated into an upturned hook c. 5 mm long. Staminal column 14-15 mm long, 4.6-5 mm diameter; anther appendages truncate, c. 0.5 mm long and 2 mm wide; alar fissure c. 1.3 mm long. Style-head c. 2 mm diameter. Carpels 9-10 mm long, 2-2.1 mm wide. Pollinarium c. 2.5 mm long and 2.5 mm wide; pollinia oblong, 1.6-1.7 mm long, 0.6-0.65 mm wide; corpusculum c. 0.6 mm long and 0.32 mm wide; caudicles c. 0.3 mm long and 0.1 mm wide. Follicle 7-10 cm long and 2.5-4 cm wide, glabrous. Seeds 8-9 mm long, 5.5-6 mm wide; coma 20-25 mm long, white. Figure 1E-F.

Specimens examined. SRI LANKA, EASTERN PROVINCE: Trincomalee Distr., beach just S of Elizabeth Point *G. Davidse* 7533 (BRI).

PAPUA NEW GUINEA: Kulo, Papua, *L.J. Brass* 511 (BRI).

AUSTRALIA, NORTHERN TERRITORY: Milngimbi, 12°06'S, 135°55'E, *G. Wightman* 720 (DNA); NE Arnhemland: Nhulunbuy, 12°10'S, 136°46'E, *G. Wightman* 4267 (DNA).

QUEENSLAND: Dauan Is., Torres Strait, 9°25'S, 142°32'E, Sept. 1971, *M. Lawrie* [AQ004046] (BRI); Magnetic Island, Oct. 1957, *T.C. Grove* [AQ216435] (BRI); Cape Pallarenda, *T. Stanley* 80177 (BRI).

CULTIVATED: Botanic Garden, Rabaul, *C.E. Blise* 607 (BRI); Island in Lake, Botanic Gardens, Lae, *A.N. Millar* GH56 (BRI); Adel's Grove via Burketown, *A. deLestang* [AQ216413] (BRI); South Johnstone, *S.T. Blake* 15271 (BRI); Baker's Shop, Kilcoy, 26°57'S, 152°33'E, *P.J. Forster* 5020, *L.H. Bird & M.C. Tucker* (BRI); Mt Coot-tha Botanic Gardens, Brisbane, Apr. 1980, *P. Foot* [AQ420949] (BRI).

Distribution. Native to Sri Lanka, India, China and Malesia. In Australia the species is naturalised at a few localities in Arnhem Land, Northern Territory and in Torres Strait. There is one 50 year old collection from southern Papua New Guinea. It is frequently cultivated in tropical areas as a garden plant.

Habitat. In Australia, plants have been collected from the vicinity of human habitation in disturbed areas.

Flowering period. Throughout the year, but most abundantly during the summer months.

Fruiting period. Generally 3-4 months after fertilisation.

Notes. *C. gigantea* is sparingly naturalised in Australia and perhaps in Papuaia. Unlike *C. procera*, *C. gigantea* does not appear to represent a serious problem as a woody weed.

Ethnobotanical use. *M. Lawrie* recorded the name of "Dcl" being used for this plant on Dauan Island, whereas *Wightman & Smith* (1989, [recorded incorrectly as *C. procera*]) did not note any name being used at Milngimbi, Arnhem Land.

Pollination Biology

Both *C. procera* and *C. gigantea* are successful as naturalised plants within the Australian landscape, however, little information is available as to the reasons for this success. As with other plants of the Asclepiadaceae, fruit set is dependent on insect mediated cross-pollination of flowers. Studies both within the natural and naturalised habitats of these *Calotropis* species outside of Australia have revealed associations between different species of *Xylocopa* bees resulting in successful cross-pollination (Wanntorp 1974, Ramakrishna & Arekal 1979, Eisikowitch 1986, Willmer 1988). My fleeting encounters with these plants in northern Australia have not allowed detailed observations of the pollinators to be achieved, but it would be expected that a range of native Hymenoptera visit the flowers as found with naturalised *Gomphocarpus fruticosus* (L.) R. Br. (Forster, unpubl.). Near Chillagoe in Queensland, a single species of bee was seen visiting flowers for nectar, however, no individuals could be captured for examination to ascertain whether or not pollinaria were being transported. On Victoria River Downs, Northern Territory and near Mt Isa, the flowers of *C. procera* had large numbers of ants in attendance which were feeding on nectar. No pollinaria were seen attached to these ants and even if there had been, it is unlikely that these ants are efficient pollinators, if indeed they pollinate at all.

Acknowledgements

The illustration was provided by M. Saul. The Directors/Curators of the listed herbaria allowed material to be examined either at their institutions or on loan. Staff at DNA and QRS allowed extended use of facilities during visits. Dr M.P. Bolton, then of the Queensland Department of Lands discussed the distribution of *C. procera* in the southern Gulf of Carpentaria and provided a number of additional distribution records. The Australian Biological Resources Study provided funding during 1988 to 1990. This assistance is gratefully acknowledged.

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